

REMARKS

The amendments to the claims do not add new matter. Claim 111 has been amended to recite that the “assembled implant is “suitable for implantation into a patient.” Support for the “assembled implant” being “suitable for implantation into a patient” is found throughout the specification, including at page 4 line 19 (“...shipment to physicians for use in implantation procedures.”). Claim 111 has also been amended to recite that the through holes are “circular.” Support for the through holes being “circular” is shown in FIG. 7A as circular holes 701, 702, 703 and 704; and is found in the specification at page 19, line 4 (“holes 701-704 have been drilled”). Accordingly, the amendments to claim 111 would not add new matter.

New claims 129-136 parallel claims 111-118 with the exception that claim 129 recites that both cortical bone portions are “allograft” bone. Support for the bone being “allograft” is found in the specification at page 3, line 5.

For all these reasons, the amendments to the claims do not add new matter.

Summary of the Bases for Rejection/Objection

Claims 111-118 and 120-128 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting over all claims in USSN 10/375,540.

Claims 111-118 and 120-123 are rejected under 35 U.S.C. § 102(b) over Albee, Scientific American, “Bone Surgery with Machine Tools,” 154(4) 178-181 (1936).

Claims 111-118 and 120-128 are rejected under 35 U.S.C. § 103(a) over U.S. Pat. 5,989,289 (Coates) in view of EP 517030 (Siebels).

Claims 111-118 and 120-128 are rejected under 35 U.S.C. § 103(a) over U.S. Pat. 5,192,327 (Brantigan) in view of U.S. Pat. 5,989,289 (Coates).

The Applicants will answer each of these bases for objection in Sections I-IV, respectively which follow.

I. Obviousness-type Double Patenting

Claims 111-118 and 120-128 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting over all claims in co-pending sister application USSN 10/375,540. No claims have been deemed allowable in the present application. Applicants will consider cofiling an appropriate terminal disclaimer at such time as claims are determined to be allowable.

II. 35 U.S.C. § 102(b) over Albee

Claims 111-118, 120-123 and 126-127 are rejected under 35 U.S.C. § 102(b) over Albee, Scientific American, “Bone Surgery with Machine Tools,” 154(4) 178-181 (1936). In response to the Official Action of 12/15/04, the Applicants amended claim 111 to recite “An assembled bone implant suitable for implantation into a patient. . .” The Patent Office responded stating “Regarding the language ‘suitable for implantation into a patient’ found in the preamble, it is not clear if that **limitation** breathes any life and meaning into the claim.” [Official Action at page 2; emphasis added in bold.] The Patent Office acknowledges that the words are a “limitation” but then misconstrues what is meant by “breathing life and meaning” into a claim. The test is whether the language in the preamble is merely a preambular statement of purpose, which is given no weight as a limitation, or is necessary to give life and meaning to the claim. The courts have recognized that when the body of a claim contains an express reference back to the antecedent recitation in the preamble, then that recitation is incorporated by reference into the claim. See Thus, in the body of claim 111, the reference back to “the assembled bone implant” means “the assembled bone implant suitable for implantation into a patient.” However, at the cost of being redundant, the Applicants have amended the last phrase in the body of claim 111 to recite “said assembled bone implant being suitable for implantation into said patient.” Accordingly, this recitation is now an element of claim 111.

Citing to “all figures, specifically figures 10-12 and 15,” the Patent Office

states that Albee discloses the elements of claim 111, prior to the amendments herein.
[Official Action at page 4.]

a first cortical bone portion;
a second cortical bone portion;
said first cortical bone portion and said second cortical bone portion
having one or more circular through holes sized and positioned for
receiving one or more retention pins for connecting said first cortical bone
portion to said second cortical bone portion; and
one or more retention pins of appropriate diameter for fitting said through
holes and connecting said first cortical bone portion to said second cortical
bone portion to form and forming said assembled bone implant as a unitary
body outside of said patient, said assembled bone implant being suitable
for implantation into said patient.

[Claim 111 as amended herein.]

The Applicants respectfully disagree.

Albee only has Figures 1-6. However, when the Patent Office is referring to FIGS. 10-12 and 15 of Albee, it is believed that the Patent Office is referring to the subparts in Figure 3 of Albee, which has subparts 1-15 therein. If the Applicants are wrong, then the Applicants request a corrected Official Action wherein the Figures are properly designated and the Applicants are not required to speculate.

1. Albee Does Not Disclose Implants That Exist in Assembled Form Outside the Body

As an initial matter, Applicants point out that the applicants are claiming an “assembled” implant that exists in “assembled” form outside the body (in vitro) and that is “suitable for implantation in the patient’s body.” They are “off the shelf” assembled devices (i.e., devices in the mechanical sense). In marked contrast, all of the grafts

disclosed in Figure 3 of Albee fail to exist in assembled form outside the body. There is no “assembled” implant disclosed in Albee that exists outside the body, and that in assembled form is “suitable for implantation into a patient.” Rather, Albee discloses shaping a single piece of the patient’s own (autograft) bone to fit between two opposing segments of the patient’s living in vivo bone to bridge a size gap or hold the two opposing living segments in appropriate juxtaposition. The resulting assembled structure is not an “assembled implant” it is a reconstructed area. Moreover, whatever is assembled in a patient in Albee exists only in vivo, and is not “suitable for implantation in a patient” because it would require removing the patients’ own bones and the interconnecting piece so that they exist in vitro as an assembled implant. Thus, at no time does Albee ever teach an “assembled implant” suitable for implantation in the body. Consistent with this interpretation, the Applicants have expanded the body of independent claim 111 to recite that the already “assembled implant” is “suitable for implantation in a patient.”

Throughout Albee’s disclosure, Albee discloses that the single piece of bone is removed from one portion of the patient as living tissue, is shaped and then transferred as a single (living) piece to the living bone in the body of the patient:

The **graft lives** if it is supplied sufficiently early and in quantity with blood from the host.

[Albee at page 180, col. 1; emphasis added in bold.]

* * *

The **vascular channel**, especially the **capillaries**, in the **graft** and host bone unite.

[Albee at page 180, col. 3; emphasis added in bold.]

* * *

Compression may kill bone cells, either **in graft** or host tissues, or close blood vessels that should otherwise bring nourishment to the **living graft cells**.

[Albee at page 181, col.2; emphasis added in bold.]

* * *

The successful **living bone-graft** is based upon a tripod of exacting conditions and environment as to mechanics, physiology and biology.

[Albee at page 181, col.2; emphasis added in bold.]

Thus, at no time does Albee disclose an isolated “assembled implant” that is suitable for implantation in a patient. Further, drawing 7 in Figure 3 of Albee is the only drawing that discloses the use of more than one isolated piece of bone. It shows the use of two pieces of bone that would be connected in the living body sequentially and never as “an assembled implant.”

Albee describes subparts 11 and 12 of Figure 3 as follows “Numbers 11 and 12 are keyed-in tension members in **broken knee caps which will not join.**” [Albee at the caption to Figure 3; emphasis added in bold.] The broken knee caps of subparts 11 and 12 of Figure 3 are “**broken**” not disconnected from the respective tendons. They “**will not join**” because they are connected to their respective tendons which are pulling them in opposite directions. For simplicity, the tendons were not shown. However, as “broken” knee caps, they exist inside the body of the patient, connected by their respective tendons to the remainder of the body. At no time do they exist outside the body so as to satisfy the limitation to an assembled implant “forming a unitary body outside the patient suitable for implantation into the patient.” For all these reasons, claims 111-118 and 120-123 would not be anticipated by Albee.

2. FIGS. 11 and 12 of Albee (Subparts 11 and 12 of Fig. 3) fail to show “D” shaped bone portions

Claim 112 recites that “said first cortical bone portion and said second cortical bone portion each have a D shape.” Claims 114-115 and 117-118 incorporate this limitation by reference thereto. The Patent Office contends that in figures 11-12, “Albee

teaches superimposed cortical bone portions each having a **D-shape** having a through hole with [sic “which”] receives the I shaped pin interpreted as having the **appropriate diameter.**” [Official Action at page 4.] The Applicants respectfully disagree.

One skilled in the art, and even a child, understands that the letter “D” is a closed loop. In contrast, the letter “C” is an open loop. The knee cap fragments shown in subparts 11 and 12 of Figure 3 of Albee are open loops and thus at best “C” shaped not “D” shaped. For this reason, claims 112, 114-115 and 117-118 would not be anticipated by Albee.

Separately, the I-shaped insert of subpart 11 of Albee and the X-shaped tenon insert of subpart 12 of Figure 3 of Albee do not have a “diameter.” However, the Patent Office has “interpreted” the I-shape and the X-shape inserts of Albee as “having the appropriate diameter.” [Official Action at page 4.] The Applicants request that the Patent Office point out where the “diameter” occurs, since a diameter is by definition associated only with circular or spherical objects.

diameter- the straight line passing through the center of a **circle, sphere**, etc., from one side to the other.

[Exhibit B: Webster’s New World Dictionary, Second College Edition, Ed, Guralnik, Prentice Hall Press, Cleveland Ohio 1986 at page 389; emphasis added in bold.]

In contrast, the I-shaped and X-shaped inserts of subparts 11 and 12 of figure 3 are substantially planar and have straight line edges. For these reasons also, claims 111-118 and 120-123 would not be anticipated by Albee.

3. FIGS. 11 and 12 of Albee (Subparts 11 and 12 of Fig. 3) fail to show a through hole in the bone portions

The Patent Office next alleges that in figures 11 and 12, “Albee teaches superimposed first and second cortical bone portions each having a D-shape having a **through hole** with [sic “which”] receives the I shaped pin interpreted as having the appropriate diameter.” [Official Action at page 4; emphasis added in bold.] One skilled in

the art, and even a child, knows that a “hole” by definition is surrounded by the material into which it is placed. For example, it is elementary that a donut hole is surrounded by the rest of the donut. If it looked as in subparts 11 or 12 of Albee, one skilled in the art would know that someone took a bite out of their donut. Likewise, a button hole on a shirt is surrounded by the rest of the shirt. If it looked like subparts 11 and 12 of Albee it would be a **notch** and not a **hole**, and it would cease to function. Finally, when a golfer hits a “hole in one” the “hole” is surrounded by the green. It is not a notch in the side of a hill. By comparison, a “notch” is defined as a cut or indentation in a surface:

notch a concave or V-shaped **cut or indentation in an edge** or across a surface.

[Exhibit B: Webster’s New World Dictionary, Second College Edition, Ed, Guralnik, Prentice Hall Press, Cleveland Ohio 1986 at page 973; emphasis added in bold.]

Referring back to subparts 11 and 12 of Figure 3 of Albee, it is clear that the broken knee cap fragments have a “notch” in their adjoining **edges** and not a hole that is otherwise surrounded by kneecap. For this reason also, claims 111-118 and 120-123 would not be anticipated by Albee.

4. Half of the Items disclosed in Figure 3 of Albee are a cabinet maker’s “joinery” which Albee presents for “analogy”

Addressing the merits of the rejection, in Figure 3 of Albee, each of subparts 1a, 2b, 3a, 4a, 5a, 6a, 7a, 7b, 8a, 9a, 10a 11a, 11b, 12a, 13a, and 15 are cabinetry joints (i.e., “joinery elements”), which Albee cites to as analogy, and not actual implants in a patient:

The fine joinery element in bone surgery-a group of **self evident analogies**.

[Albee at caption to Figure 3; emphasis added in bold.]

* * *

For help with the mechanical problem, **one must go to the joiner**

and **study** his various forms of **mortise** and how he selects each according to the mechanical demands of the situation (Figure 3).

[Albee at page 180, col. 2; emphasis added in bold.]

In Figure 3, only subparts 1, 2, 2a, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, and 14 show a bone repair using a single isolated and shaped piece of living bone to connect or bridge the gap between adjacent pieces of bone in vivo. As discussed above, subpart 7 of Figure 3 discloses the use of two separate pieces of bone that are connected (by the disclosed mortise and tenon joint) only when attached to the body (in vivo). Thus, at no time does Albee teach or suggest an “assembled implant suitable for implantation in a patient.”

For all these reason, Albee would not be anticipatory of any of claims 111-118, (withdrawn claim 119), 120-123, and 126-127 of the present invention. Albee also would not be anticipatory of any of newly added claims 129-136 because they include the same limitations.

III. 35 U.S.C. § 103(a), Coates over Siebels

Claims 111-118 and 120-128 are rejected under 35 U.S.C. § 103(a) over U.S. Pat. 5,989,289 (Coates) in view of EP 517030 (Siebels). According to the Patent Office, “[r]eferring to all figures, Coates teaches a D-shaped cortical bone spinal implant. . . .” [Official Action at pages 5 citing to Coates at col. 11, lines 42 et seq.] The Patent Office admits that **“Coates et al fails to teach said implant can comprise a first and second portion capable of being connected by a pin.”** [Official Action at page 5; emphasis added in bold.] To make up for this deficiency, the Patent Office cites to Siebels, stating that Siebels discloses “a spinal implant and teaches stacking portions 11 of the implant and connecting said portions with pins 17.” [Official Action at page 4.] The Patent Office then concludes that “[i]t would have been obvious to one skilled in the art to have utilized the teachings of Siebels to stack and connect the individual implant portions with the D-shaped cortical bone implant of Coates wherein multiple portions could be stacked and connected by at least one pin in corresponding through holes to adjustably

build the implant to a desired height (thickness) to best fill the disk space as desired by the surgeon.” [Official Action at page 5.] The Applicants respectfully disagree.

In order for an invention to be obvious, “Both the suggestion and the expectation of success must be founded in the prior art, not in applicant’s disclosure.” *Amgen v. Chugai*, 18 USPQ2d 1016, 1022 (Fed. Cir. 1991); emphasis added in bold. In the present case, Siebels discloses that it was an object of their invention to make an implant that can “easily be manufactured for a multiplicity of overall dimensions.”

Therefore, the objective to develop an implant of the kind mentioned at the outset, which can rapidly be implanted and which - from the standpoint of manufacturing engineering - can also **easily be manufactured for a multiplicity of overall dimensions**, forms the basis of the [proposed] invention.

In accordance with the invention, the set objective is achieved with the help of the features, cited in claim 1.

[English Translation of Siebels at page 2, line 20 to page 3, line 1; emphasis added in bold.]

To achieve the “ease” of manufacturing, Siebels relies upon cutting discs out of “prefabricated solid or hollow strand.” [English Translation of Siebels at page 3, line 7.] Specifically, Siebels discloses that this mode of manufacturing, comprising cutting appropriately sized strands made of “fiber reinforced plastic” provides for “manufacturing” in a “extraordinarily easy way”:

The disk-shaped implant is preferably made of fiber-reinforced plastic [FRP]. In accordance with a preferred embodiment of the invention, in order to produce a single-piece implant, the disk is cut out of a hollow strand, which consists of a multiple number of braiding layers [plaiting layers]. The braiding layers, are wound up one after another on a correspondingly shaped mandrel [arbor], preferably on a mandrel, having rectangular cross-section and rounded corners, directly in a braiding machine. The disks are cut off with the desired height, which can vary over the disk. Implants of this kind are characterized in that they can be manufactured in an **extraordinarily easy way**, in which the **fiber orientation** equally **imparts an optimal rigidity and strength** to

the implant.

[English Translation of Siebels at page 3, line 22 to page 4, line 9;
emphasis added in bold.]

Thus, the heart of Siebel's invention is a prefabricated template that can be cut into directly useable slices to produce an implant "in an extraordinarily easy way." By use of the adjective "extraordinary," Siebels meant to convey that the disclosed process of manufacturing plastic implants was not just "easy" but "extraordinarily easy."

In addition, the above quote from Siebels teaches that "fiber orientation" is important because it "imparts an optimal rigidity." The word "optimal" is a superlative and means "most favorable or desirable; best; optimum." [Exhibit B: Webster's New World Dictionary, Second College Edition, Ed. Guralnik, Prentice Hall Press, 1986 at page 999; emphasis added in bold.] Thus, fiber orientation is a necessary element in the material used by Siebels to "impart optimal rigidity."

In contrast to the "extraordinarily easy" method of manufacturing disclosed in Siebels (that provides for an implant having "optimal rigidity"), Coates discloses that "developing an implant having the biomechanical properties of metal and the biological properties of bone without the disadvantages of either has been extremely difficult or impossible." [Coates at col. 3, lines 35-39.] By this statement, Coates teaches that as of its filing date (October 1995), cortical bone was not a "traditional orthopedic implant material" for spinal implants. It was considered "extremely difficult or impossible" to provide an implant that had the benefits of both bone and metal without their undesired properties. The words "extremely difficult or impossible" are superlatives related to difficulty or impossibility. Given this "extremely difficult or impossible" setting, one would not have been motivated to substitute the cortical bone of Coates for the preformed plastic of Siebels. Given the art recognized extreme difficulty or impossibility, one skilled in the art would have even been less motivated to build an implant from little pieces of bone held together with pins, and there would not have been a reasonable expectation of success that the Applicants' would have been able to make implants for use in the spine from assembled pieces of cortical bone. See *Amgen v. Chugai*, 18 USPQ2d at 1022. For

these reasons, claims 111-118 and 120-128 would not have been obvious under 35 U.S.C. § 103(a) over U.S. Pat. 5,192,327 (Brantigan) in view of U.S. Pat. 5,989,289 (Coates).

In response to the Applicants' arguments, the Patent Office contends that "Coates specifically states that the implant of Brantigan is flawed because the materials used (including metals) of Brantigan are too stiff which causes stress shielding, etc." [Official Action at page 3.] However, as correctly pointed out in the very next sentence of the Official Action, Coates remarks are limited to metals:

Coates in the very next paragraph teaches that bone as an implant material "**avoid[s] the disadvantages of metal implants**": see column 2, lines 49 et seq.

[Official Action at page 3, quoting Coates; emphasis added in bold.]

However, Siebels' implants are not limited to metals. Siebel also teaches that its **preferred embodiment** is not a metal either, but rather is a fiber (e.g., graphite) reinforced plastic (as on the stealth bomber), which does not have the disadvantages associated with metal such as stress-shielding, or radio-opaqueness:

The disk-shaped implant is **preferably** made of **fiber-reinforced plastic [FRP]**. In accordance with a **preferred embodiment** of the invention, in order to produce a single-piece implant, the disk is cut out of a hollow strand, which consists of a multiple number of braiding layers [plaiting layers]. The braiding layers, are wound up one after another on a correspondingly shaped mandrel [arbor], preferably on a mandrel, having rectangular cross-section and rounded corners, directly in a braiding machine. The disks are cut off with the desired height, which can vary over the disk. Implants of this kind are characterized in that they can be manufactured in an **extraordinarily easy way**, in which the **fiber orientation** equally **imparts an optimal rigidity and strength** to the implant.

[English Translation of Siebels at page 3, line 22 to page 4, line 9; emphasis added in bold.]

See also Brantigan at [Brantigan at col. 3, lines 9-12 ("The **implants** are **preferably** made

of **radiolucent** material such as **carbon fiber reinforced polymers**. . . .”].] Coates does not address or overcome the advantages associated with fiber reinforced plastic, so as to motivate one skilled in the art to disregard the advantages associated with Siebels’ ease of construction and stated advantages relative to bone which required complex machining and was totally untested in stacked formation. In fact, Siebels states that this preferred embodiment imparts “**optimal rigidity**.” Coates never addressed this preferred embodiment which Siebels also disclosed was “preferred” over metal.

For this reason and all of the above reasons, the combination of Coates and Siebels would have failed to render obvious claims 111-118 and 120-128 at the time that the Applicants’ invention was made.

IV. 35 U.S.C. § 103(a), Brantigan over Coates

Claims 111-118 and 120-128 are rejected under 35 U.S.C. § 103(a) over U.S. Pat. 5,192,327 (Brantigan) in view of U.S. Pat. 5,989,289 (Coates). According to the Patent Office, Figures 2 and 5 of Brantigan teach a D-shaped implant comprising:

a first portion 21;

a second portion 21;

said first portion and said second portion having one or more through holes 24 sized and positioned for receiving one or more retention pins 15 for connecting said first ~~cortical-bone~~ [sic] portion to said second ~~cortical-bone~~ [sic] portion; and

one or more retention pins of appropriate diameter for connecting said first ~~cortical-bone~~ [sic] portion to said second ~~cortical-bone~~ [sic] portion to form said assembled bone implant unitary body.

[Official Action at pages 6-7; strikeout corrections added.]

The above statement from the Patent Office is incorrect on its face because Brantigan never discloses any component or “portion” of an implant that is made of “**cortical bone**.” In a

later sentence of the Official Action, the Patent Office acknowledges that “**Brantigan fails to teach that the first and second portions are cortical bone.**” [Official Action at page 7; emphasis added in bold.] Moreover, in the Patent Office’s argument quoted above, the terms “said first cortical bone portion” and “said second cortical bone portion” lack antecedent basis and the resulting argument is indefinite. As a result, it is difficult to know what the Patent Office is contending.

1. **When Brantigan is Properly interpreted, there is no Motivation to substitute the cortical bone of Coates for the “fiber reinforced plastic” in the implants of Brantigan**

The Patent Office next contends that “[i]t would have been obvious to one of ordinary skill in the art to have used cortical bone which is a traditional, orthopaedic implant material as taught by Coates for any of the elements of Brantigan because ‘5,192,327 to Brantigan teach hollow metal cage structures. Unfortunately, due to the stiffness of the material, some metal implants may stress shield the bone graft, increasing the time required for fusion or causing the bone graft to resorb inside the cage. Subsidence, or sinking of the device into bone, may also occur when metal implants are implanted between vertebrae if fusion is delayed. Metal devices are also foreign bodies which can never be fully incorporated into the fusion mass.’” [Official Action at page 7.] The Applicants respectfully submit that Coates misinterprets Brantigan.

Specifically, Coates teaches away from the use of metals, just as Brantigan teaches away from metals. As a matter of law, “A prior art reference may be considered to **teach away** when ‘a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or **would be led in a direction divergent from the path taken by the applicant.**” *Monarch Knitting v. Sulzer*, 45 USPQ2d 1977, 1984 (Fed. Cir. 1998) (emphasis added in bold.). In particular, Brantigan teaches that fiber reinforced plastics are “preferred” over metals:

The **implants are preferably** made of radiolucent material such as **carbon fiber reinforced polymers** known commercially as

"Peek", (polyetherether ketone) or "Ultrapek" (polyether ketone, ether ketone, ketone). Alternately, polycarbonate, polypropylene, polyethylene and polysulfone type plastics material filled with glass or carbon fibers can be used. Such materials are supplied by ICI Industries of Wilmington, Del.; Fiber-Rite Corporation of Winona, Minn. or BASF Corporation.

[Brantigan at col. 3, lines 9-18; emphasis added in bold.]

In fact, other than in Brantigan's Abstract, Brantigan never mentions the five specific metals (that are the traditional orthopaedic materials). Thus, Brantigan taught away from the use of metals by teaching that a preference for fiber reinforced plastic (as also used in Siebels), over metals. Coates never addressed Brantigan's primary disclosure, which is directed to the use of fiber reinforced plastics which is the heart of Brantigan's invention. Further, Coates' arguments at col. 2, lines 54-65 regarding the stress shielding caused by the stiffness of titanium alloys (114Gpa) and 316L stainless steel (193Gpa) versus cortical bone (about 17Gpa) do not apply to the carbon fiber reinforced PEEK (17.8 Gpa), carbon fiber reinforced polyetherketoneetherketoneketone (PEKEKEKK) (6.9-29.4 Gpa) or carbon fiber reinforced polycarbonate (4.1-21.4 Gpa) as disclosed in Brantigan at col. 3, lines 9-13. [See Exhibit A: from www.matweb.com at page 2, line 10 "Flexural modulus".] These fiber reinforced polymers have a stiffness (e.g. 17.8 Gpa) that is analogous to the stiffness cortical bone (about 17 Gpa) and substantially less than the stiffness (114-193 Gpa) of the recited metals. [These arguments apply with equal force regarding the carbon fiber reinforced plastic of Siebels in Section III supra.] Thus, the fiber reinforced plastics of Brantigan do not have the disadvantage of "stress shielding" that is associated with metals. Further, the fiber reinforced plastics of Brantigan (and Siebel) offer yet another advantage of cortical bone because, unlike metals, both are transparent to X-rays. (See Coates at col. 2, lines 62-65 ("Moreover, bone as an implant also allows excellent postoperative imaging because it does not cause scattering like metallic implants on CT or MRI imaging."); Brantigan at col. 3, lines 9-10 ("The implants are preferably made of radiolucent material such as carbon fiber reinforced polymers known commercially as 'Peek' (polyetheretherketone) or 'ultrapeek' (polyether ketone, ether ketone, ketone)"); and Siebel

– Eng translation at page 6, 2nd full ¶ (“Preferably, the disks are made of a carbon-fiber reinforced plastic (CFP) whereby the anchoring means - according to the design of the implant - can consist of the same, or another material. The manufacturing of the entire implant of CFP has the advantage that the implant does not bring about any scattering of rays, so that the spinal column and the adjacent biological tissue can also be examined after the implantation of a spinal-column replacement with the help of all image-producing methods (CT, MR);” emphasis added in bold). Thus, Coates misstates the teaching in Brantigan, which is not limited to metal implants, but rather is directed as its preferred embodiment to implants made from “carbon fiber reinforced plastic.” Hence, one skilled in the art, upon reading both Coates and Brantigan, would not have been motivated to substitute the cortical bone of Coates for the fiber reinforced plastic of Brantigan, which Coates never discussed.

2. There is No Suggestion to Substitute Cortical Bone for Plastic or a Reasonable Expectation of Success

The Patent Office next contends that it “would have been obvious to one having ordinary skill in the art to have utilized cortical bone which is a traditional orthopedic implant material as taught by Coates for any of the elements of Brantigan.” [Official Action at page 7.] The Applicants respectfully disagree.

In order for an invention to be obvious, “Both the suggestion and the expectation of success must be founded in the prior art, not in applicant’s disclosure.” *Amgen v. Chugai*, 18 USPQ2d 1016, 1022 (Fed. Cir. 1991); emphasis added in bold. In the present case, at the time of Brantigan’s 1991 filing date, Brantigan expressly teaches that the traditional orthopedic materials for spinal implants were “nickel, chromium, cobalt, stainless steel or titanium.” [Brantigan at the Abstract, last two lines.] At the time of Coates’ earliest claimed filing date (October 1995), Coates teaches that “developing an implant **having the biomechanical properties of metal and the biological properties of bone without the disadvantages of either** has been **extremely difficult or impossible**.” [Coates at col. 3, lines 35-39; emphasis added in bold.] Thus, at the filing date (October

1995) of Coates, Coates teaches that cortical bone was not a “traditional orthopedic implant material” for spinal implants. It was considered “extremely difficult or impossible” to provide an implant that had the benefits of both bone and metal without their undesired properties. Given this “extremely difficult or impossible” setting, there would not have been a reasonable expectation of success that the Applicants’ would have been able to make implants for use in the spine from assembled pieces of cortical bone. However, Coates comments, while specifically addressing metal implants, never addressed the graphite reinforced implants of Brantigan which even Brantigan preferred over metal and which had the same modulus of flexibility as bone (thereby overcoming stress shielding of metal) and which were radiolucent (thereby overcoming the radio-opacity of metal) and which were easy to make in any size. For these reasons, claims 111-118 and 120-128 would not have been obvious under 35 U.S.C. § 103(a) over U.S. Pat. 5,989,289 (Coates) in view of EP 517030 (Siebels)..

3. Even if Combined, the Combination of Coates and Brantigan would not make a prima facie case of Obviousness

Independent claim 111 of the Applicants’ invention includes as elements the following:

a first cortical bone portion;

a second cortical bone portion;

said first cortical bone portion and said second cortical bone portion having one or more **circular through holes** sized and positioned for receiving one or more **retention pins** for connecting said first cortical bone portion to said second cortical bone portion; and

one or more **retention pins of appropriate diameter** for fitting said through holes and connecting said first cortical bone portion to said second cortical bone portion to form and forming said assembled bone implant as a unitary body outside of said patient, said assembled bone implant being suitable for implantation into

said patient.

[Claim 111 as amended herein; emphasis added in bold.]

Thus, one of the elements of Applicant's claim 111 is a "retention pin of appropriate diameter." Independent claim 120 also recites the same term "retention pin". One skilled in the art recognizes that the ordinary meaning of the term "diameter" means that the retention pin has a substantially circular cross section. This is also seen in the circular "through holes" 701-704 of Applicants' FIG. 7A. In contrast, Brantigan does not teach or suggest the use of any "pins" of any "diameter." Rather, Brantigan discloses the use of a "rectangular connecting bar" of FIG. 3 to interconnect a plurality of D-shaped plastic devices of FIG. 2 in stacked array as shown in FIG. 5 of Brantigan:

These grooves are provided for mounting a rectangular connecting bar 15 shown in FIG. 3. This **bar 15** has **flat side faces 15a**, rounded side edges 15b to **snugly fit the grooves 14**. . . .

[Brantigan at col. 4, lines 25-28; emphasis added in bold.]

The Patent Office has acknowledged that Coates "fails to teach said implant can comprise a first and second portion capable of being connected by a pin." [Official Action at page 4.] Thus, the combination of Coates and Brantigan fail to teach or suggest an essential element of claim 111, i.e., a "retention pin" having a rounded cross section of "appropriate diameter" for the "**circular** through hole." Likewise independent claim 126 also recites as an element a "retention pin." Claims 112-118, 120-125 and 127-128, which ultimately depend from claims 111 and 126, would also incorporate the limitation to a "retention pin" and "circular through hole" by reference thereto. Accordingly, claims 111-118 and 120-128 would not have been obvious over the combination of Coates and Brantigan.

CONCLUSION

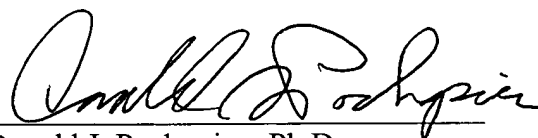
The provisional rejection of all claims of this restricted invention for double patenting over all claims of a separately restricted sister application will be address at such time as claims in one of the applications has been allowed. The rejection of claim 117 under 35 U.S.C. § 112, second paragraph, for indefiniteness has been rendered moot by amendment herein. The rejection of claims 111-118, 120-123 and 126-127 under 35 U.S.C. § 102(b) over Albee have been rebutted by evidence and arguments herein. The rejection of claims 111-118 and 120-128 under 35 U.S.C. § 103(a) over U.S. Pat. 5,989,289 (Coates) in view of EP 517030 (Siebels) have been rebutted by evidence and arguments herein. Finally, the rejection of claims 111-118 and 120-128 under 35 U.S.C. § 103(a) over U.S. Pat. 5,192,327 (Brantigan) in view of U.S. Pat. 5,989,289 (Coates) have been rebutted by evidence and arguments herein. For the same reasons, these bases for rejection should not apply to parallel claims 129-136 which include the same elements.

The allowance of claims 111-118 and 120-136 is respectfully requested.

Respectfully submitted,

McANDREWS, HELD & MALLOY, LTD.

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Dated: December 19, 2005

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Physical			
1	<input checked="" type="checkbox"/> Density (g/cc) 1.4	1.33 - 1.41	1.21 - 1.39
2	<input checked="" type="checkbox"/> Water Absorption (%) 0.17	0.1 - 0.2	0.08 - 0.2
3	<input checked="" type="checkbox"/> Linear Mold Shrinkage (cm/cm) --	0.0005 - 0.001	0.0005 - 0.0053
4	<input checked="" type="checkbox"/> Linear Mold Shrinkage, Transverse (cm/cm) --	0.015	--
Mechanical			
5	<input checked="" type="checkbox"/> Hardness, Rockwell R --	--	118 - 120
6	<input checked="" type="checkbox"/> Tensile Strength, Ultimate (MPa) 218	183 - 269	83 - 200

7	Tensile Strength, Yield (MPa)	--	--	110
8	Elongation at Break (%)	1.6	1.4 - 2.5	1.5 - 8
9	Modulus of Elasticity (GPa)	--	12.4 - 26.2	4.8 - 24.1
10	Flexural Modulus (GPa)	17.8	6.9 - 21.4	4.1 - 21.4
11	Flexural Yield Strength (MPa)	297	270 - 379	124 - 296
12	Compressive Yield Strength (MPa)	--	--	114 - 152
13	Izod Impact, Notched (J/cm)	--	1 - 1.1	0.48 - 1.87
14	Izod Impact, Notched (ISO) (kJ/m ²)	9	--	--
15	Izod Impact, Unnotched (J/cm)	--	8 - 9.1	2.94 - 9.5
16	Izod Impact, Unnotched (ISO) (kJ/m ²)	43.2	--	--
17	K (wear) Factor	--	5000	--
Electrical				
18	Electrical Resistivity (ohm-cm)	5500	100000	5 - 1e+010
19	Surface Resistance (ohm)	--	--	5 - 1e+010
Thermal				
20	CTE, linear 20°C (µm/m-°C)	--	--	13 - 31
21	Thermal Conductivity (W/m-K)	--	--	0.55 - 0.72
22	Maximum Service Temperature, Air (°C)	--	--	100 - 149
23	Deflection Temperature at 0.46 MPa (66 psi) (°C)	--	--	141 - 151
24	Deflection Temperature at 1.8 MPa (264 psi) (°C)	--	271 - 354	100 - 149

25	 Glass Temperature (°C)	--	--	150
26	 Flammability, UL94	--	--	HB - V-0
Processing				
27	 Processing Temperature (°C)	--	--	300 - 318
28	 Mold Temperature (°C)	--	--	85 - 121
29	 Drying Temperature (°C)	--	--	120
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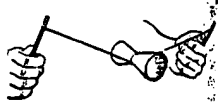
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1. of the Devil or devil
Also *diabolical*

< LL. (Ec.) *diabolus*
allusions with the Devil
2. belief in or worship
tion or behavior 4. the
vil or a devil — *diabol*

ng 1. to make diabolical
07; prob. < Gr. *diabolos*



DIABOLO

ce formed by refraction

+ CHRONIC] of or con-
curring over a period of
diachronical *adv.*
g in each molecule two
asic atoms or radicals:
2. capable of forming a
molecule of a diacid, or
ases and alcohols — *n.*
hydrogen atoms which
with basic substances
(Ec.) *diachronical* of a

onatus] 1. the rank,
ard of deacons
diakrinos < *diakrinein*,
rein, to separate: see
iacritical mark
g to distinguish; dis-
g to distinguish; dis-
diacritical *adv.*
macron or a cedilla
s pronunciation or to

ble of transmitting

Di- + Gr. *adelphos*,
indies
said
so ar-

OFR.
na, a
mn, a
dein
head-
ower,
adem

A- +
iting
iting
1 of

DIADELPHOUS
STAMENS
(of pea)

: see DIA- & GENE-
anges occurring in
of deposition up

n. [DIA- + GEOT-
anches, rhizomes,
tion horizontal to
p/ik (-jē'a trāp'ik)

Par- + -vich (syer
allet producer &

sed', -nos'ing [
sease, a problem,

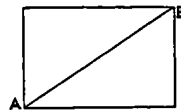
2) [ModL. < Gr.
in, to distinguish
[NOW] 1. the act
used condition by
examination and
rstand or explain
3. a decision or
ol. a short scien-

nosticus < Gr.
osis 2. of value
1. [usually pl.,
f diagnosis, esp.
n or symptom;

erson who makes
is

diagonal (dī'ag'ə-nəl) *adj.* [L. *diagonalis* < Gr. *diagonios*

< *dia-*, through + *gonia*, an angle,
corner: for IE, base see KNEE] 1.
extending between the vertices of any
two nonadjacent angles in a poly-
gonal figure or between any two
vertices not in the same face in a
polyhedral figure; extending slant-
ingly between opposite corners 2.
moving or extending obliquely, esp.
at a 45° angle; slanting 3. having slanting markings, lines,
etc. — *n.* 1. a) a diagonal line or plane b) same as VIRGULE
2. any diagonal course, row, order, or part 3. cloth woven
with diagonal lines; twill — *diagonal* *adv.*



DIAGONAL

diagram (dī'ə-gram) *n.* [Gr. *diagramma* < *diagraphēin*,
to mark out by lines, draw < *dia-*, through, across +
graphein, to write: see GRAPHIC] 1. a geometrical figure,
often used to illustrate a theorem 2. a sketch, drawing, or
plan that explains a thing by outlining its parts and their
relationships, workings, etc. 3. a chart or graph explaining
or illustrating ideas, statistics, etc. — *vt.* -gramed' or
-grammed', -gram'ing or -gram'ming to show or repre-
sent by a diagram; make a diagram of — *diagrammatic* (
grə-mat'ik), *diagrammatical* *adj.* — *diagrammatical* *adv.*

diakinesis (dī'ə ki-nē'sis) *n.* [ModL. < DIA- + Gr.
kinēsis, motion: see KINEMATICS] in the meiosis of germ
cells, a stage in which the maternal and paternal chromo-
somes have paired within the nucleus — *diakinesis* (
-net'ik) *adj.*

dial (dī'əl, dīl) *n.* [ME. < ML. *dialis*, daily < L. *dies*, day:
see DEITY] 1. a sundial 2. the face of a watch or clock 3.
the face of a meter, gauge, compass, etc. on which a pointer
or the like indicates an amount, degree, direction, etc. 4.
a graduated disk on a radio, or television set, esp. one for
tuning in stations or channels 5. a rotating disk on a
telephone, used in making connections automatically — *vt.*,
vi. -aled or -alled, -al'ing or -al'ing 1. to measure with or
as with a dial 2. to show on a dial 3. to tune in (a radio
station, television channel, program, etc.) 4. to call on a
telephone by using a dial

dial 1. dialect(al) 2. dialectic(al)
dialect (dī'ə-lect) *n.* [L. *dialectus* < Gr. *dialektos*,
discourse, discussion, dialect < *dialegesthai*, to discourse,
talk < *dia-*, between + *legin*, to choose, talk: see LOGIC] 1.
the sum total of local characteristics of speech 2. the
sum total of an individual's characteristics of speech;
idiolect 3. any form of speech considered as deviating
from a real or imaginary standard speech 4. the form or
variety of a spoken language peculiar to a region, com-
munity, social group, occupational group, etc.: in this
sense, *dialects* are regarded as being, to some degree,
mutually intelligible while *languages* are not mutually
intelligible 5. any language as a member of a group or
family of languages (English is a West Germanic *dialect*)
— *adj.* of or in dialect [*dialect* ballads] — *dialectal* *adj.*
— *dialectal* *adv.*

SYN. — *dialect*, in this comparison, refers to a form of a language
peculiar to a locality or group and differing from the standard
language in matters of pronunciation, syntax, etc.; vernacular
today commonly refers to the informal or colloquial variety of a
language as distinguished from the formal or literary variety;
cant, in this connection, refers to the distinctive stock words and
phrases used by a particular sect, class, etc. (clergymen's *cant*);
jargon is used of the special vocabulary and idioms of a particular
class, occupational group, etc., esp. by one who is unfamiliar with
these; argot refers esp. to the secret jargon of thieves and
tramps; lingo is a humorous or mildly contemptuous term applied
to any language, dialect, or jargon by one to whom it is unintelligible

dialect atlas same as LINGUISTIC GEOGRAPHY

dialect geography same as LINGUISTIC GEOGRAPHY
dialect *adj.* (dī'ə-lect) *n.* [ME. *dialectik* < OFr. *dialectique*
< L. *dialectica* (ars) < Gr. *dialektikē* (technē), the dialectic
(art) < *dialektikos*: see DIALECT] 1. [often pl.] the art or
practice of examining opinions or ideas logically, often by
the method of question and answer, so as to determine
their validity 2. logical argumentation 3. [often pl.] a) the
method of logic used by Hegel and adapted by Marx to
observable social and economic processes: it is based on
the principle that an idea or event (*thesis*) generates its
opposite (*antithesis*) leading to a reconciliation of oppo-
sites (*synthesis*) b) the general application of this principle
in analysis, criticism, exposition, etc. — *adj.* same as
DIALECTICAL

dialectical (dī'ə-lect-i-cal) *adj.* 1. of or using dialectic or dia-
lectic 2. of or characteristic of a dialect; dialectal —
dialectically *adv.*

dialectical materialism the philosophy stemming from
Marx and Engels which applies Hegel's dialectical method to
observable social processes and to nature

dialectician (dī'ə-lect-i-shən) *n.* [Fr. *dialecticien*] 1. an
expert in dialectic; logician 2. a specialist in dialects

dialectology (dī'ə-lect-ol-ə-jē) *n.* the scientific study of dia-
lects — *dialectologist* *n.* — *dialectological* (dī'ə-lect-ol-og-i-
kəl) *adj.* — *dialectologically* *adv.*

di-al-lage (dī'ə lij) *n.* [Fr. < Gr. *diallagē*, change, inter-
change < *diallassein*, to interchange < *dia-*, through +
allassein, to alter < *allos*, other (see ELSE): so named from
having unlike fracture planes] a dark-green mineral that
is a laminated variety of pyroxene

di-a-log (dī'ə lɔg', -lāg') *n.*, *v.* same as DIALOGUE
di-a-log-i-cal (dī'ə lɔj'ə kəl) *adj.* of or marked by dialogue:
also *di-a-log'ic* — *di-a-log'ic-al* *adv.*

di-al-o-gist (dī'ə lɔj'ist, dī'ə lɔg'ist, -lāg'ist) *n.* 1. a writer
of dialogue 2. a person who takes part in a dialogue
— *di-al-o-gis-tic* (dī'ə lɔj'is'tik) *adj.*

di-a-logue (dī'ə lɔg', -lāg') *n.* [ME. *dialog* < OFr. *dialogue*
< L. *dialogus* < Gr. *dialogos* < *dialegesthai*: see DIALECT] 1.
a talking together; conversation 2. interchange and
discussion of ideas, esp. when open and frank, as in seeking
mutual understanding or harmony 3. a written work in
the form of a conversation 4. the passages of talk in a
play, story, radio act, etc. — *vi.* -logued', -logu'ing to hold
a conversation — *vt.* to express in dialogue

Dialogue Mass R.C.Ch. a Low Mass at which the congrega-
tion, following an earlier custom now revived, makes the
responses aloud and in unison

* *dial tone* a low buzzing sound indicating to the user of a
dial telephone that the line is open and a number may be
dialed

di-al-y-sis (dī'ə lə sis) *n.*, *pl.* -ses' (-sēz') [L. < Gr.,
separation, dissolution < *dialyein*, to separate, dissolve <
dia-, apart + *lyein*, LOOSE] the separation of crystalloids
or dissolved substances from colloids in solution by the
greater diffusibility of the smaller molecules through a
semipermeable membrane: used as in the mechanical
elimination of impurities from the blood during kidney
failure — *di-a-lyt-ic* (dī'ə lit'ik) *adj.* — *di-a-lyt'ic-al* *adv.*

di-a-lyze (dī'ə līz') *vt.* -lyzed', -lyz'ing to apply dialysis to
or separate by dialysis — *vi.* to undergo dialysis

di-a-lyz-er (dī'ə līz'ər) *n.* an apparatus for dialyzing, esp. one
used as an artificial kidney

diam. *diameter*
di-a-mag-net-ic (dī'ə mag-net'ik) *adj.* having or relating
to diamagnetism — *n.* a diamagnetic substance, as bismuth
or zinc: also *di-a-mag-net*

di-a-mag-net-ism (-mag'nə tiz'm) *n.* 1. the property
that certain substances have of being repelled by both
poles of a magnet and hence taking a position at right
angles to the magnet's line of influence 2. diamagnetic
force 3. diamagnetic phenomena 4. the science that deals
with such phenomena and substances

di-a-man-té (dē'ə mən tā', -mān'tā; Fr. dyā mən tā') *adj.*
[Fr. < pp. of *diamanter*, to tinsel, lit., set with diamonds <
diamant, DIAMOND] decorated with rhinestones or with
other brightly glittering bits of material [*diamanté* sandals]
— *n.* glittering ornamentation

di-am-e-ter (dī'am'ət'ər) *n.* [ME. & OFr. *diametre* < ML.
diametra < L. *diametros* < Gr. *diametros* < *dia-*, through +
metron, a measure: see METER] 1. a straight line passing
through the center of a circle, sphere, etc. from one side to
the other 2. the length of such a line; width or thickness
of a circular, or somewhat circular, figure or object 3.
Optics the unit of measure of the magnifying power of a lens
di-a-met-ri-cal (dī'ə met'ri kəl) *adj.* 1. of or along a
diameter: also *di-am-e-tral* (dī'am'ət'rəl) 2. designating
an opposite, a contrary, a difference, etc. that is wholly so;
complete [*diametrical* opposites]: also *di-a-met'ric* — *di-a-*
met'ri-cal *adv.*

di-am-ine (dī'am'ēn, -in; dī'ə mēn') *n.* any of a group of
chemical compounds containing two NH₂ radicals; double
amine

di-a-mond (dī'mənd, ə mənd) *n.* [ME. *diamaunt* < OFr.
diamant < ML. *diamas* (gen. *diamantis*), for L. *adamas* <
Gr. *adamas*, adamant, diamond] 1. a mineral consisting of
nearly pure carbon in crystalline form, usually colorless,
the hardest natural substance known: transparent, un-
flawed stones are cut into precious gems of great brilliance;
less perfect forms are used for cutting tools, abrasives,
phonograph-needle tips, etc. 2. a gem or other piece cut
from this mineral 3. a) a lozenge-shaped plane figure (♦)
b) a red mark like this, used for one of the four suits of
playing cards c) [pl.] this suit d) a card of this suit 4.
Baseball a) the infield b) the whole playing field — *adj.* of,
like, or set with a diamond or diamonds — *vt.* to adorn with
or as with diamonds — *diamond* in the rough 1. a diamond
in its natural state 2. a person or thing of fine quality but
lacking polish

diamond anniversary the sixtieth, or sometimes seventy-
fifth, anniversary of an event

di-a-mond-back (-bak') *adj.* having diamond-shaped
markings on the back — *n.* 1. a large, poisonous rattle-
snake (*Crotalus adamanteus*) with diamond-shaped mark-
ings on its back, native to the S. U.S. 2. an edible turtle
(*Malaclemys terrapin*) with diamond-shaped markings on
its shell, found in coastal salt marshes from Cape Cod to
Mexico: in full, diamondback terrapin 3. a small, brown
and white cosmopolitan moth (*Plutella maculipennis*)
whose wings, when folded, form a diamond

Diamond Head promontory in Honolulu, Hawaii

fat, āpe, cār, ten, ēven; is, bīte; gō, hōrn, tōōl, look; oil, out; up, fār; get; joy; yet; chin; then; zh, leisure; ŋ, ring;
a for e in ego, e in agent, i in sanity, u in comply, u in focus; * as in able (ə'b'l); Fr. bāl; ē, Fr. coeur; ō, Fr. fr. mon; ō, Fr. coq;
ū, Fr. duc; r, Fr. cri; H, G. ich; kh, G. doch. See inside front cover. ★ Americanism; † foreign; * hypothetical; < derived from

optic axis in a crystal not having the same properties in all directions with regard to light, a direction along which there is no apparent double refraction since both components of the light ray have the same velocity

optic disk same as **BLIND SPOT** (sense 1)

op-ti-cian (ap'tish'ən) n. [Fr. *opticien*] a person who makes or deals in optical instruments, esp. one who prepares and dispenses eyeglasses

optic nerve either of the second pair of cranial nerves, which connect the retina of the eye with the brain

op-tics (ap'tiks) n.pl. [with sing. v.] [**OPTIC**] the branch of physics dealing with the nature and properties of light and vision

op-ti-mal (ap'tə māl) adj. [**OPTIM(UM)** + **-AL**] most favorable or desirable; best; optimum — **op-ti-mal-ly** adv.

op-ti-mism (-miz'm) n. [Fr. *optimisme* < L. *optimus*, best (see **OPTIMUM**)] 1. *Philos.* a) the doctrine held by Leibniz and others that the existing world is the best possible

b) the doctrine or belief that good ultimately prevails over evil 2. the tendency to take the most hopeful or cheerful view of matters or to expect the best outcome; practice of looking on the bright side of things — **op-ti-mist** (-mist) n. — **op-ti-mis'tic** (-mis'tik), **op-ti-mis'ti-cal** adj. — **op-ti-mis'ti-cal-ly** adv.

op-ti-mize (-miz') vi. -mized', -miz'ing to be given to optimism — **ut.** to make the most of; develop or realize to the utmost extent; obtain the most efficient or optimum use of — **op-ti-mi-za'tion** n.

op-ti-mum (-mām) n., pl. -mums, -ma (-mə) [L., neut. of *optimus*, best < *ops*, power, riches: for base see **OPUS**]

1. the best or most favorable degree, condition, amount, etc. 2. *Biol.* the amount of heat, light, moisture, food, etc. most favorable for growth and reproduction — **adj.** most favorable or desirable; best; optimal

op-tion (ap'shən) n. [Fr. < L. *optio* < *optare*, to wish, desire, ult. < IE. base **op-*, to choose, prefer] 1. the act of choosing; choice 2. the power, right, or liberty of choosing 3. something that is or can be chosen; choice

4. the right, acquired for a consideration, to buy, sell, or lease something at a fixed price, sign or renew a contract, etc. within a specified time — **ut.** *Sports* to transfer (a player) to a minor league with the option of recalling him — **SYN.** see **CHOICE**

op-tion-al (-'l) adj. left to one's option, or choice; not compulsory; elective — **op-tion-al-ly** adv.

op-to-e-lec-tron-ics (ap'tō i lek'trən'iks) n.pl. a branch of electronics involving the use of optical technology — **op-to-e-lec-tron'ic** adj.

op-tom-e-ter (ap'təm'ə tər) n. [see **OPTIC** & **-METER**] an instrument for determining error in the refractive power of the eye

op-tom-e-trist (-trist) n. a specialist in optometry

op-tom-e-try (-trē) n. [see **OPTIC** & **-METRY**] 1. measurement of the range and power of vision 2. the profession of examining the eyes and measuring errors in refraction and of prescribing glasses to correct these defects — **op-to-met-ric** (ap'tə met'rik), **op-to-met'ri-cal** adj.

op-u-lent (ap'yə lənt) adj. [L. *opulentus* or *opulens* < *ops*: see **OPUS**] 1. very wealthy or rich 2. characterized by abundance or profusion; luxuriant — **SYN.** see **RICH** — **op-u-lence**, **op-u-len-cy** n. — **op-u-lent-ly** adv.

o-pun-ti-a (ō pun'shē, -shē) n. [ModL. < L. (*herba*) *Opuntia*, (plant) of Opus, city in Locris, Greece] any of a large genus (*Opuntia*) of cactus plants with red, purple, or yellow flowers, pulpy or dry berries, and fleshy, jointed stems, including the prickly pears and chollas

o-pus (ō'pəs) n., pl. o-pes-ra (ō'pə rə, ap'ər ə), o'pus-es [L., a work < IE. **ops* < base **op-*, to work, riches, whence L. *ops*, riches, Sans. *āpas-*, work, OE. *efnan*, to work, do] a work; composition; esp., any of the musical works of a composer numbered in order of composition or publication

o-pus-cule (ō pus'kyūl) n. [Fr. < L. *opusculum*, dim. of *opus*: see **prec.**] a minor work — **o-pus'cu-lar** adj.

-o-py (ō'pē) same as **-OPIA**

o-quas-sa (ō kwas'ə) n. [*Oquassa* Lake, in Maine] a small trout (*Salvelinus oquassa*) of lakes of W. Maine

or¹ (ōr; unstressed ə) conj. [ME., in form a contr. of *other*, *auither*, either, but actually < OE. *oththe* (in *āther* . . . *oththe*, either . . . or)] a coordinating conjunction introducing an alternative; specif., a) introducing the second of two possibilities (beer or wine) b) introducing any of the possibilities in a series, but usually used only before the last (apples, or pears, or plums) c) introducing a synonymous word or phrase (botany, or the science of plants) d) introducing the second of two possibilities when the first is introduced by *either* or *whether* (either go or stay, whether to go or stay) e) substituted for *either* as the first correlative ("or in the heart or in the head")

or² (ōr) conj., prep. [ME. < OE. *ār*, var. of *ær*, *ere*: cf. **ERE**] [Archaic or Dial.] before; ere

or³ (ōr) n. [Fr. < L. *aurum*, gold: for IE. base see **EAST**] *Heraldry* gold or yellow, represented in engraving by small dots powdered over a plain field

-or (ər; occas. ōr) 1. [ME. -*our* < OFr. -*our*, -*or*, -*eur* < L.

-*or*, -*ator*] a *n.-forming suffix* meaning a person or thing that [inventor, objector] 2. [ME. -*our* < OFr. < L. -*or*] a *n.-forming suffix* meaning quality or condition [horror, error]: in Brit. usage, often -*our*

to-ra (ō'rə) n. pl. of **OS**

or-ach, **or-ache** (ō'rəch, ār'ə) n. [ME. *orache* < Anglo-Fr. *orache* < OFr. *arroche* < VL. **atrapica* (for L. *atriplex*) < Gr. *atraphaxys*] any of a genus (*Atriplex*) of plants of the goosefoot family, widespread in salty or alkaline areas, having usually silvery foliage and small green flowers; esp., garden orach (*Atriplex hortensis*), cultivated as a potherb, chiefly in France

or-a-cle (ō'rə k'l, ār'ə) n. [ME. < OFr. < L. *oraculum*, divine announcement, oracle < *orare*, to speak, pray, beseech < *os* (gen. *oris*), the mouth: see **ORAL**] 1. among the ancient Greeks and Romans, a) the place where, or medium by which, deities were consulted b) the revelation or response of a medium or priest 2. a) any person or agency believed to be in communication with a deity b) any person of great knowledge or wisdom c) opinion or statements of any such oracle 3. the holy of holies of the ancient Jewish Temple: I Kings 6:16, 19-23

o-rac-u-lar (ō rak'yoolər) adj. 1. of, or having the nature of, an oracle 2. like an oracle; wise, prophetic, mysterious, etc. — **o-rac'u-lar'i-ty** (-yə lar'ə tē) n. — **o-rac'u-lar-ly** adv.

o-rad (ō'rəd) adv. [*<* L. *os* (gen. *oris*), the mouth + **-AD**] toward the mouth or oral region

O-ra-dea (ō rād'yā) city in NW Romania, near the Hungarian border: pop. 112,000

o-ral (ō'rəl) adj. [*<* L. *os* (gen. *oris*), the mouth < IE. base **ōus-*, mouth, edge, whence Sans. *ā-h*, mouth, ON. *ōss*, mouth of a stream] 1. uttered by the mouth; spoken 2. of speech; using speech 3. of, at, or near the mouth 4. *Phonet.* having mouth resonance only: distinguished from **NASAL** 5. *Psychoanalysis* a) designating or of the earliest stage of psychosexual development in which interest centers around sucking, feeding, and biting b) designating or of such traits in the adult as friendliness, generosity, and optimism or aggressiveness and pessimism, regarded as unconscious psychic residues of that stage: cf. **ANAL**, **GENITAL** 6. *Zool.* on or of the same side as the mouth — **an.** an examination that is oral and not written, as in a college — **o-ral-ly** adv.

SYN. — **oral** refers to that which is spoken, as distinguished from that which is written or otherwise communicated (an oral promise, request, etc.); **verbal**, though sometimes synonymous with **oral**, in strict discrimination refers to anything using words, either written or oral, to communicate an idea or feeling (a verbal image, caricature, etc.)

oral history 1. historical data consisting of personal recollections, usually in the form of a tape-recorded interview 2. the gathering and preservation of such data

o-ral-ism (ō'rəl iz'm) n. the theory or practice of teaching the deaf to read lips and to speak — **o-ral-ist** adj., n.

O-ran (ō ran'; Fr. *ō rān'*) seaport in N. Algeria, on the Mediterranean: pop. 430,000

o-rang (ō ran', ə-) n. same as **ORANGUTAN**

Or-ange¹ (ō'rinj, ār'ə) ruling family of the Netherlands: see **NASSAU** — **adj.** of or having to do with Oran-gemen

Or-ange² (ō'rinj, ār'ə; also, for 3 & 4, Fr. *ō rānz'*) 1. [prob. after the orange groves there] city in SW Calif.: suburb of Los Angeles: pop. 92,000 2. river in South Africa, flowing from NE Lesotho west into the Atlantic: c. 1,300 mi. 3. former principality of W. Europe, now in SE France 4. city in SE France: pop. 21,000

or-ange (ō'rinj, ār'ə) n. [ME. < OFr. *orange* < Pr. *auranja* (with sp. influenced by L. *aurum*, gold & loss of initial *n* through faulty separation of art. *un*) < Sp. *naranja* < Ar. *nāranj* < Per. *nārang* < Sans. *naranga*, prob. akin to Tamil *narū*, fragrant] 1. a reddish-yellow, round, edible citrus fruit, with a sweet, juicy pulp 2. any of various evergreen trees (genus *Citrus*) of the rue family producing this fruit, having white, fragrant blossoms, often carried by brides, and hard, yellow wood 3. any of several plants or fruits resembling the orange 4. reddish yellow — **adj.** 1. reddish-yellow 2. made with or from orange 3. having a flavor like that of oranges — **or'ang-y** (-in jē) adj.

or-ange-ade (-ād') n. [Fr.: see **ORANGE** & **-ADE**] a drink made of orange juice and water, usually sweetened

Orange Free State province of South Africa, west of Lesotho: formerly a Boer republic (1854-1900) & then a Brit. colony (Orange River Colony, 1900-10): 49,866 sq. mi.; pop. 1,387,000; cap. Bloemfontein

orange hawkweed same as **DEVIL'S PAINTBRUSH**

Or-ange-ism (ō'rinj iz'm, ār'ə) n. the principles and practices of the Oran-gemen

Or-ange-man (-mən) n., pl. -men (-mən) [after the Prince of Orange, later WILLIAM III] a member of a secret Protestant society organized in N. Ireland (1795)

orange pekoe a black tea of Ceylon and India: see **PEKOE**

or-ange-ry (ō'rinj rē, ār'ə) n., pl. -ries [Fr. *orangerie* < *orange*, orange tree < *orange*] a hothouse or other sheltered place for growing orange trees in cooler climates

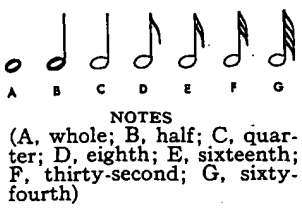
orange stick a pointed stick, orig. of orangewood, used in manicuring

fat, āpe, cār; ten, ēven; is, bīte; gō, hōrn, tōōl, look; oil, out; up, fūr; get; joy; yet; chin; she; thin, then; zh, leisure; ŋ, ring; a for a in ago, e in agent, i in sanily, o in comply, u in focus; ' as in able (ā'b'l); Fr. bāl; ē, Fr. coeur; ō, Fr. feu; Fr. mon; ō, Fr. coq; ū, Fr. duc; r, Fr. cri; H, G. ich; kh, G. doch. See inside front cover. *Americanism; †foreign; *hypothetical; < derived from

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no-show (nō'shō) *n.* [Colloq.] a person who makes a reservation, as for an airline flight, but fails to claim or cancel it
no-thing (nō'thɪŋ) *n.* [NOSE + -ING] 1. the projecting edge of a step; that part of the tread which extends beyond the riser 2. a strip, as of metal, for protecting this edge from wear 3. any projection like a stair nosing
no-sog-ra-phy (nō sāg'rā fē) *n.* [prec. + -GRAPHY] the systematic description of diseases
no-sol-o-gy (nō sāl'ə jē) *n.* [ModL. *nosologia*: see NOSO- & -LOGY] 1. classification of diseases 2. the branch of medicine dealing with this —**no-sol-o-gic** (nās'ə lāj'ik), **no-sol-o-gi-cal** *adj.* —**no-sol-o-gi-cal-ly** *adv.*
nos-tal-gia (nās tal'jə, nās-, nōs-, -jə ə) *n.* [ModL. < Gr. *nostos*, a return + -ALGIA] 1. a longing to go back to one's home, home town, or homeland; homesickness 2. a longing for something far away or long ago or for former happy circumstances —**nos-tal-gic** (-jɪk) *adj.* —**nos-tal-gi-cal-ly** *adv.*
nos-toc (nās'tāk) *n.* [ModL., coined by Paracelsus] any of a genus (*Nostoc*) of blue-green algae, having twisted, coiled filaments embedded in a gelatinous material and forming spherical colonies
nos-tol-o-gy (nās täl'ə jē) *n.* [*Gr. nostos*, a return + -LOGY] earlier term for GERONTOLOGY —**nos-to-log'ic** (-tə lāj'ik) *adj.*
nos-to-ma-ni-a (nās'tə mā'nē ə, -mān'yə) *n.* [ModL. < Gr. *nostos*, a return + -MANIA] *Psychiatry* excessive or abnormal nostalgia
Nos-tra-da-mus (nās'trə dā'məs, nō'strə dā'məs) (born Michel de Notredame) 1503-66; Fr. astrologer
nos-tril (nās'trəl) *n.* [ME. *nosethril* < OE. *nostrhyr* < nos, for *nosu*, the nose + *thyr*, a hole < *thurh*, through; see NOSE & THROUGH] 1. either of the external openings of the nose 2. the fleshy wall on either side of the nose (with flaring nostrils)
nos-trum (nās'trəm) *n.* [L., neut. of *noster*, ours: ? so called from the seller's calling it "our" remedy] 1. a medicine prepared by the person selling it 2. a patent medicine of a kind sold with exaggerated claims; quack medicine 2. a pet scheme for solving some social or political problem; panacea
nos-y (nō'sē) *adj.* **nos'y-er**, **nos'y-est** [NOS(E) + -Y] [Colloq.] given to prying; inquisitive —**nos'y-ly** *adv.* —**nos'y-ness** *n.*
Nosy Parker (pār'kər) [NOSY + proper name *Parker*: reason for use uncertain] [*also* n- p-, n- P-] [Colloq.] a nosy person; busybody
not (nāt) *adv.* [ME. *not*, unstressed form of *nought*, *nought*; *naught*: see NOUGHT] in no manner; to no degree: a note of negation, or word expressing the idea of no, often implying refusal, affirmation of the opposite, etc.: sometimes used elliptically (whether you like it or not)
not- (nōt) same as NOTO-: used before a vowel
no-ta-be-ne (nō'tə bē'nē, nō'tā bē'nā) [L.] note well; take particular notice
no-ta-bil-i-ty (-bīl'ē ə, -bīl'yə) *n.pl.* [L., neut. pl. of *notabilis*: see ff.] things worthy of notice
no-ta-bil-i-ty (nō'tə bīl'ə tē) *n.* 1. *pl.* -ties a person who is notable or prominent 2. the quality of being notable
no-ta-ble (nō'tə b'l; for *adj.* 2, also nāt'-) *adj.* [ME. < OFr. < L. *notabilis* < *notare*, to mark, note < *nota*, a mark: see NOTE] 1. worthy of notice; remarkable; outstanding 2. [Archaic] industrious and capable, as in housekeeping —*n.* 1. a person of distinction; famous or well-known person 2. [N-] formerly in France, any of the persons of authority, rank, etc. summoned by the king as a deliberative assembly in emergencies —**no'ta-bly** *adv.*
no-tar-i-al (nō ter'ē əl) *adj.* 1. of or characteristic of a notary public 2. drawn up or executed by a notary public —**no-tar'i-al-ly** *adv.*
no-tar-ize (nō'tə rīz') *vt.* -rized-, -riz'ing to certify or attest (a document) as a notary public, esp. with a signature seal —**no'tar-i-za'tion** *n.*
no-tar-y (nō'tər ē) *n., pl.* -ries [ME. *notarye* < OFr. *notaire* < L. *notarius* < *notare*, to NOTE] *clipped form of* NOTARY PUBLIC
notary public *pl.* **notaries public**, **notary publics** an official authorized to certify or attest documents, take depositions and affidavits, etc.
no-ta-tion (nō tā'shən) *n.* [L. *notatio* < *notare*, to NOTE] 1. the use of a system of signs or symbols to represent words, phrases, numbers, quantities, etc. 2. any such system of signs or symbols, as in mathematics, chemistry, music, etc. 3. a brief note jotted down, as to remind one of something, explain something, etc. 4. the act of noting something in writing —**no-ta-tion-al** *adj.*
notch (näch) *n.* [prob. by syllabic merging of ME. *an oche* < OFr. *oche*, *osche*, a notch < *oschier*, to notch] 1. a concave or V-shaped cut or indentation in an edge or across a surface 2. a narrow pass with steep sides; defile; gap 3. [Colloq.] a step; grade; degree; peg (a notch below average) —*vt.* 1. to cut a notch or notches in; indent with notches 2. to record or tally, as by means of notches —**notched** *adj.* —**notch'er** *n.*

note (nōt) *n.* [ME. < OFr. < L. *nota*, a mark, sign, character, letter < *notus*, pp. of *noscere*, to know < *gnoscere*: for IE. base see KNOW] 1. a mark of some quality, condition, or fact; distinguishing or characteristic feature, mood, tone, etc. (a note of sadness) 2. importance, distinction, or eminence (a person of note) 3. a) a brief statement of a fact, experience, etc. written down for review, as an aid to memory, or to inform someone else; memorandum b) [pl.] a record of experiences, etc. (the notes of a journey) 4. a comment, explanation, or elucidation, as at the foot of a page; annotation 5. notice; heed; observation (worthy of note) 6. any of certain types of correspondence; specif., a) a short, informal letter b) a formal diplomatic or other official communication 7. a) any of certain commercial papers, some of which are negotiable, relating to the owing of debts or payment of money (a promissory note) b) a piece of paper currency (a Federal Reserve note) 8. a cry or call, as of a bird 9. a signal or intimation (a note of admonition) 10. [Archaic or Poet.] a melody, tune, or song 11. *Music* a) a tone of definite pitch, as made by a voice or musical instrument b) a symbol for a tone, indicating the duration by its form and the pitch by its position on the staff c) a key of a piano or the like —*vt.* **not'ed**, **not'ing** [ME. *noten* < OFr. *noter* < L. *notare* < *nota*] 1. to pay close attention to; heed; notice; observe 2. to set down in writing; make a note of 3. to mention particularly 4. to denote, signify, or indicate 5. to set down in musical notes —**compare** notes to exchange views; discuss —**strike the right note** to say, write, or do what is especially apt or pleasing —**take notes** to write down notes, as during a lecture or interview, for later reference
note-book (nōt'book') *n.* a book in which notes, or memorandums, are kept
note-case (-kās') *n.* [Brit.] same as BILLFOLD
not-ed (nōt'id) *adj.* distinguished; well-known; renowned; eminent —*SYN.* see FAMOUS —**not'ed-ly** *adv.* —**not'ed-ness** *n.*
note-less (nōt'lis) *adj.* 1. not noted; unnoticed; undistinguished 2. unmusical
note of hand same as PROMISSORY NOTE
note paper paper for writing notes, or letters
note-wor-thy (-war'wē) *adj.* worthy of note; deserving notice; outstanding; remarkable; notable —**note'wor-thi-ly** *adv.* —**note'wor'thi-ness** *n.*
noth-ing (nuth'in) *n.* [ME. < OE. *na thing*, *nan thing*] 1. a) no thing; not anything; nought b) no part, element, trace, etc. (nothing of kindness in him) 2. a) nonexistence; nothingness b) insignificance; unimportance 3. a thing that does not exist 4. a) something of little or no value, seriousness, importance, etc.; triviality or trifle b) a person considered of no value or importance 5. a) nought; zero; cipher —*adv.* not at all; in no manner or degree (nothing daunted) —**for nothing** 1. free; at no cost 2. in vain; uselessly 3. without reason —**have nothing on** to have no implicating evidence, information, etc. about —**in nothing flat** [Colloq.] in almost no time at all —**make nothing of** 1. to treat as of little importance 2. to fail to understand —**nothing but only**; nothing other than —**nothing doing** [Colloq.] 1. no: used as a refusal of a request 2. no result, accomplishment, etc.: an exclamation of disappointment —**nothing less than** no less than; just the same as: also **nothing short of** —**think nothing of** 1. to attach no importance to 2. to regard as easy to do
noth-ing-ness (-nis) *n.* 1. the quality or condition of being nothing or not existing; nonexistence or extinction 2. lack of value, worth, meaning, etc.; uselessness, emptiness, insignificance, etc. 3. unconsciousness or death 4. anything that is nonexistent, worthless, insignificant, useless, etc.
no-tice (nōt'is) *n.* [LME. < MFr. < L. *notitia* < *notus*: see NOTE] 1. information, announcement, or warning; esp., formal announcement or warning, as in a newspaper (a legal notice) 2. a brief mention or critical review of a work of art, book, play, etc. 3. a written or printed sign giving some public information, warning, or rule 4. a) the act of observing; attention; regard; heed; cognizance b) courteous attention; civility 5. a formal announcement or warning of intention to end an agreement, relation, or contract at a certain time (to give a tenant notice) —*vt.* -ticed-, -tic-ing 1. a) to mention; refer to; comment on b) to review briefly 2. a) to regard; observe; pay attention to b) to be courteous or responsive to 3. [Rare] to serve with a formal notice —*SYN.* see DISCERN —**serve notice** to give formal warning or information, as of intentions; announce —**take notice** to become aware; pay attention; observe



fat, āpe, cār; ten, ēven; is, bite; gō, hōrn, tōōl, look; oil, out; up, fūr; get; joy; yet; chin; she; thin, then; zh, leisure; n, ring; e for a in ago, e in agent, i in sanity, o in comply, u in focus; ' as in able (ā'b'l); Fr. bāl; ē, Fr. coeur; ō, Fr. feu; Fr. mon; ō, Fr. coq; ū, Fr. duc; r, Fr. cri; H, G. ich; kh, G. doch. See inside front cover. ★ Americanism; † foreign; * hypothetical; † derived from

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